# FAA GENERAL AVIATION NEWS

A FLIGHT STANDARDS SAFETY PUBLICATION FOR AIRMEN

## Feathered Foes

# FAA GENERAL AVIATION NEWS

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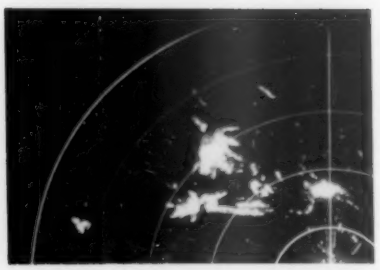

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# The Silent Air War

The intrusion of man into the airspace, regarded by birds as their private domain prior to the Wright brothers first successful flight in 1903, went unchallenged apparently for almost ten years. The first official recorded downing of an aircraft by a bird occurred in 1912, in California, when a seagull brought down a Curtiss *Flyer* by jamming itself into the control cables, with fatal consequences to the pilot. The air war between men and birds has continued to this day, with increasing frequency of collisions and injuries.

The hazards to air safety posed by birds has been slow to find acceptance among pilots. Most airmen operating within the migratory flyways have been cautioned to be alert during the fall and spring migrations, and will avoid known feeding and nesting grounds during these seasons. Otherwise they feel it is strictly up to the birds—to keep out of their way. Reports of birds actually damaging an aircraft or bursting into the cockpit are so infrequent that they are often regarded as an amusing oddity. Since there is no requirement to report a collision with bird, or birdstrike, unless there is serious damage or injury, our data on this subject is far from complete.

However, we know enough to be certain that it is not a laughing matter. Since 1955 there have been 73 crashes of civilian and military aircraft known to be caused by birdstrikes, resulting in 138 deaths. The repair bill for birdstrike damage to aircraft runs into millions of dollars annually.

Furthermore we now know that the majority of birdstrikes do not take place within the flyways at altitude. About 80 percent of all civilian aviation birdstrikes occur *near airports*, during landing or takeoff, usually between 200 and 1,000 feet above the ground. During migrations birds fly at altitudes varying normally from 500 to about 6,000 feet AGL. The highest ever recorded birdstrike, involving an air carrier jet and a "bearded vulture" over the west coast of Africa, took place at *37,000 feet MSL*. In our own country the record high altitude strike involved a mallard duck at 21,000 feet MSL, over Nevada in 1962.

In the early days of this struggle between man and bird, when both were about equally matched as regards airspeed, it was a fairly simple matter for the highly maneuverable bird to avoid an airplane if it so chose. However, the rapid increase in aircraft speed, especially with the advent of turbine powered airplanes, has outclassed the bird so badly in this department that the responsibility for avoiding a collision now rests almost entirely with the airman.

Higher speeds have also led to greater force of impact—with more serious consequences. Birds are usually thought of as being "light as a feather," posing no formidable threat to an aircraft protected with metal and plexiglass, but it must be remembered that velocity is a more important factor than weight. In a collision the energy of the impact is increased by the square of the increase in airspeed—i.e., if the speed of impact is doubled, the energy of the impact is *quadrupled*. Doubling the weight of the bird, on the other hand, only doubles the force of impact.

Not all birds are featherweights. Humming birds may weight only one-tenth of an ounce, but trumpeter or whistling swans may easily weigh 30 lbs. A collision with a 30 lb. bird at a closure rate of 200 mph results in an impact force of 40,000 lbs. Almost enough to damage armor plating.

On November 23, 1962, a *Viscount* air carrier on a regular scheduled flight from Newark, N.J., to Washington, D.C., had just left 10,000 feet for 6,000 when the Center advised that large flocks of geese and ducks had been seen on radar in the area. Shortly thereafter the *Viscount* apparently flew through a flock of whistling swans, taking at least two strikes on the horizontal stabilizer. One bird punctured the leading edge of the stabilizer and passed completely through it, damaging the elevator. The aircraft became uncontrollable and crashed, killing all 17 on board.

Whistling swans migrate at this season along a narrow and fairly well-defined flight path, passing close to the airports of Duluth, Milwaukee, Detroit, Toledo, Cleveland, Buffalo, Pittsburgh, Harrisburg (Pa.), Baltimore, and Washington, D.C. Other types of swans winter on Great Salt Lake in Utah, and fly north in the spring either along the Pacific Coast or over the Rocky Mountains, to reach their breeding grounds in the Canadian Arctic.

*Geese* are considered the greatest hazard to aircraft because of their abundance, large size, prevalence of large flocks (up to 25,000 birds), relatively slow flight and high altitude during migration. Nearly half a million Canadian geese migrate south from Hudson or James Bay to the Mississippi Valley, and perhaps as many as 100,000 of these birds pass within 25 to 50 miles west of Milwaukee Municipal and Chicago O'Hare Airports. Stray flocks may pass directly over the airports.

Geese moving north in the spring fly up the Missouri River Valley in very large flocks, creating hazards to aircraft in the vicinity of airports at Kansas City, Omaha, Sioux City, and Sioux Falls.

Mallard and pintail ducks are among the most numerous birds of passage in the United States. Each migration season between seven and fifteen million ducks pass

through the Mississippi Valley. Three to six million move along the Central Valley of California, and two to three million migrate along the Atlantic coastal states. More ducks pass in the vicinity of Lambert Field, St. Louis, than any other major air terminal.

The *density* of a flock, rather than individual size, can create the hazard. Starlings, for example, weigh only about three ounces each, but they are responsible for the greatest recorded loss of life in a birdstrike accident. The crash occurred at Logan Airport in Boston, on October 4, 1960. A four-engine *Electra* turboprop flew through a flock of starlings on takeoff, and the two left engines sucked in enough birds to cause a complete power loss in one engine and severe loss in the other. The aircraft stalled, then spun into Winthrop Bay, killing 62 persons on board.

A similar fatal accident occurred to a *Learjet* departing from DeKalb-Peachtree Airport in Atlanta. An IFR clearance had been received, the weather was good and the two crewmembers and three passengers were looking forward to a pleasant flight to Miami. Some bird activity had been reported on the airport earlier, but no serious thought was given to the possibility of a birdstrike. It was not migration season and Atlanta is not on any migratory flyway, so the crew did not expect anything other than a normal takeoff.

As the Lear rolled down the runway, the noise from its twin jet engines disturbed a flock of cowbirds that had been feeding near the runway. The startled birds took off, apparently to try to avoid the airplane, and flew directly into its path. Enough birds were ingested into the engines to cause one to partially lose power and the other to flame-out. With so little thrust available, there was no possibility of returning to the airport for an emergency landing; the jet began an uncontrolled descent and crashed into a group of buildings near the airport. All five persons aboard were killed.

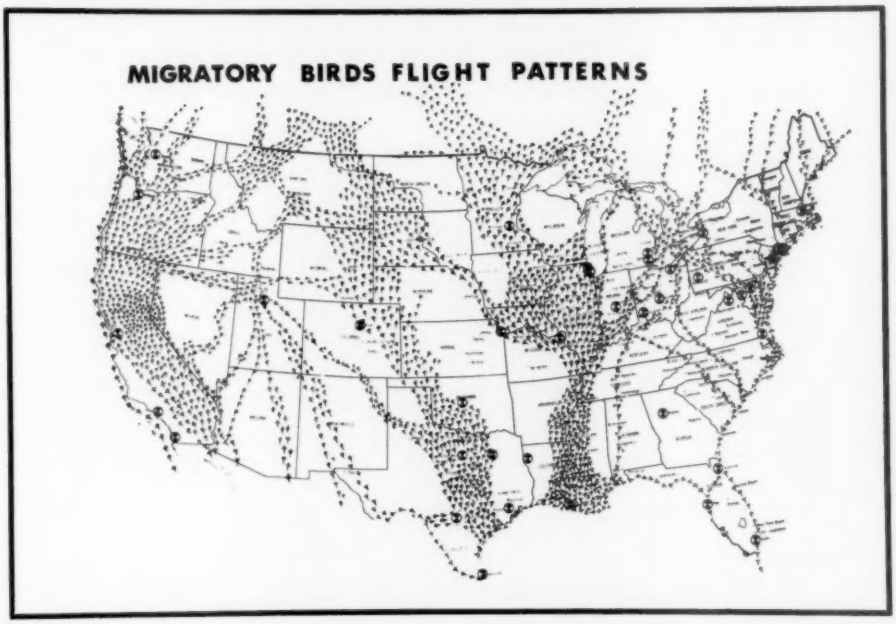
While most birdstrikes are not as serious as these, the incidents are typical in that they occurred *near an airport and during the take-off phase of the flight.*

Even smaller flying creatures, such as *bats*, have caused flameouts in the engines of military jet trainers on night missions. The cause of these accidents remained a mystery until it was determined that bats, swarming by the millions after dark to reach certain feeding areas, were the culprits.

Bats and birds in flight are not the only creatures involved in collisions with aircraft. Pilots have reported hitting a chicken at 800 feet, a snake at 3,000 feet, a flying squirrel at 5,000 feet, and a mouse at 8,000 feet. How the critters got there is a cause for some speculation, but the best guess is that they were dropped by a bird of prey as it tried to avoid the airplane.

Aircraft of virtually every type and size have been victims of birdstrikes, from 747 jumbo jets to Cessna 150 trainers. A student pilot on his first solo, at Opa Locka, Fla., had a gull crash through the windscreen of his 150—which made that flight particularly memorable to him. (He managed an off-airport landing with only minor injuries.)

Serious problems may result when birds, like these albatross, nest on one side of the runway and feed on the other. *Below*—Heaviest migratory bird traffic is on indicated flyways.




While engine failure from bird ingestion is rare in piston-driven aircraft, just about every other kind of damage has occurred: broken control linkage, damaged control surfaces, broken propellers, smashed or obscured windshields, battered nose cones, loss of antennas, etc. In most of these cases the pilot had no advance warning of the hazard.

In order to understand the problem better and reduce the danger, studies have been conducted of bird behavior and means of influencing birds. There seems to be general agreement upon the following points:

**Sight and vision.** Experiments have proven that birds see and hear well, and they rely on these senses to warn of danger. The more visible an aircraft is, because of size, color, lighting or other reasons, and the more time the bird has to perceive it, the greater the possibility that a conflict will be avoided. Evidence also exists, however, that birds cannot predict an airplane's flight path if it is *not in a straight line.* Many birdstrikes take place in turns, with the bird apparently flying directly into the path of the airplane.

**Predictability of behavior.** Since aircraft are not a part of their natural environment, birds are not instinctively equipped to cope with them. Bird reaction to the threat of an aircraft varies greatly, not only from one species to another, but from one individual bird to another, depending upon such factors as time of day and year; age, health and hunger of the bird; speed and appearance of the aircraft, etc.

Some species of gull, for example, will

rest and feed only yards away from a taxiing or departing aircraft. If it becomes necessary to move to avoid being run down, the gulls may fly only a few yards off, out of the immediate path of danger, and land and continue feeding. But if startled they may panic and fly a zig-zag course directly ahead of the airplane.

Some waterfowl will occasionally try to outfly an aircraft, turning out of its flight path only at the last second. An eagle or hawk may even attack an airplane, viewing it as potential prey when seen from a great distance, and discovering its error too late to veer off (the diving attack could attain speeds exceeding 100 mph).

Means of avoiding collisions with birds fall into three main categories: pilot responsibility, airport bird control, and limited radar advisories. In certain modes, air traffic radar can be used to track the movement of large flocks of birds, and airmen in contact with the air traffic system can be alerted. However, this coverage is not normal. The best means the pilot has of making the aircraft conspicuous to the birds is with lighting. FAA recommends that landing lights be turned on within ten miles of any airport, day or night; also under reduced visibility conditions anywhere; and whenever bird migrations are expected or reported. Strobe lights and other forms of anticollision lights should be used whenever the engines are running.

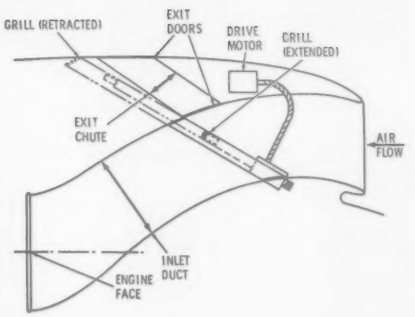
Pilots can also protect themselves by becoming familiar with known nesting or bird feeding grounds in their area of the country, and making it a point to avoid them. Most birds are creatures of habit, as regards the territory they inhabit and fly over. If leaving them undisturbed means detouring several miles out of your way, the little time lost may be compensated for by the increased safety: after all birds were here first.

Many attempts have been made to develop a device to be carried on board an aircraft to disperse birds in its flight path. Laser beams, microwave emitters, and special high-intensity lights have been tried, but with no real success.

Similarly, no successful means has been found of protecting jet engines from sucking in birds. Screens have been tested but they have been ineffective for various reasons. Research has been conducted on *deflectors* which could deflect birds or other airborne foreign objects away from sensitive areas of the engine without appreciative loss of engine performance.

No particular time of day or weather condition has been identified with a prevalence of birdstrike accidents, although they are infrequent during actual IFR conditions. Daytime strikes outnumber night accidents by about two to one.

A great deal of research is being done on reducing birdstrikes around airports by reducing or eliminating the local bird population. Birds are attracted to airports for a variety of reasons and if the attractions can be eliminated the birds will leave. If the attraction is something that can not be changed, other means, such as scaring, or trapping, is used to remove them.




Schemetic drawing of a "bird deflector grill" designed to remove birds from turbine engine inlets by sweeping them out through chutes. The device is effective, but causes a slight loss of power and increase in fuel consumption. FAA test data has been forwarded to engine manufacturers for consideration.

The primary attraction of airports for birds is food. The large open areas around runways have been considered ideal locations for refuse landfills, to be used by the airport and neighboring communities. But gulls, starlings, crows and other scavenger birds are drawn to the refuse area to feed, often in large numbers. Similarly, a large pond provides food and a resting place for ducks, coots, and other marsh birds. Grassy areas breed insects and earthworms that come to the surface and crawl onto runways after a rainfall, drawing gulls, robins, starlings and others. If the open areas around runways are leased to farmers, many types of birds may be drawn to their crops.

Removing food as an attraction to birds is considered so important by the FAA that it has ordered that all sanitary landfills within prescribed distances from federally funded airports be closed. FAA Order 5200.0, *Guidance Concerning Sanitary Landfills on or Near Airports* gives the particulars of this requirement.

The ICAO Airport Services Manual, Part 3, "Bird Control and Reduction," recommends that all surface water on or near airports be drained or filled in, and no farming (except that which will not attract birds) be allowed in the immediate vicinity of runways. Where there is a persistent bird hazard, an ornithologist should be consulted to determine how to make the airport as unattractive as possible to the problem birds.

In situations where reducing the food supply will not cause the birds to leave, efforts have been made to scare them away. Birds of prey, usually hawks, have been trained to attack local birds. This is very effective as long as the hawk is active, but shortly after the hawk is removed the birds return. It is expensive to keep a hawk and trainer on duty constantly during daylight hours, and hawks will not hunt at night.

Radio-controlled model airplanes that look like hawks have been tested in Canada, but with very limited effect.

Explosions, sirens, unnatural sounds and natural sounds (such as taped bird distress calls) all work to some degree as scare devices. But, since birds hear in the same range that humans do, noises that birds find offensive are usually offensive to people also. Such scare noises lose their effect as they are repeated over and over with no actual harm coming to the birds they are supposed to threaten. Birds are easily frightened, but they are also faced with the alternative that they must feed or perish, so they learn to live with some degree of anxiety, or ignore threats to their safety—much like the farmers who stopped responding to the Boy Who Cried "Wolf!"

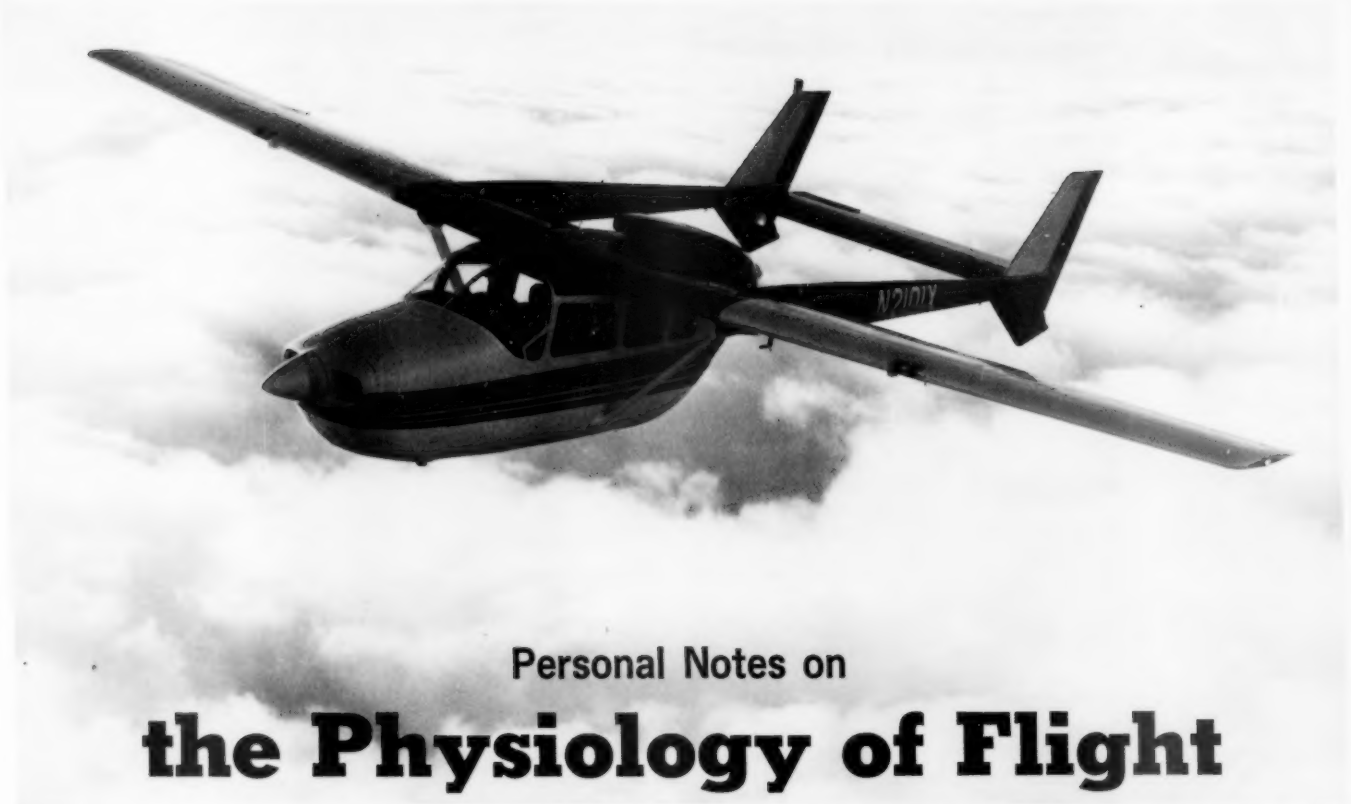
An ornithologist (bird scientist) will seek to identify the problem-birds and determine their source of food. Where this turns out to be insects or earthworms, it is sometimes possible to destroy these with pesticides. However, any such procedures must be undertaken with extreme care, and approved by local health authorities, since many of the pesticides are also harmful to human beings, through runoff into public drinking sources, or into water used by cattle. Care must also be taken not to threaten the bird population itself in view of increasing concern over upsetting the balance of nature. Draining or filling-in low areas may give better results safely.

Any of these programs may work well at some airports, but all involve some expense and concern. Especially at airports not federally funded, airmen whose safety is at stake may have to persuade the airport management that a bird removal program is needed. Up-to-date literature on this subject is available through the FAA District Office or Accident Prevention Specialist.

One helpful service the concerned airman can perform is to document any birdstrike, no matter how slight the incident. District offices will provide FAA Form 3830 (also available at many airports), a brief postage-paid questionnaire that will go a long way toward helping researchers understand bird activity at your airport, and could lead to a reduction of the hazard.

**Protect Your Eyes**

Protective lenses (either prescription or sunglasses) made of an approved shatterproof material should be worn in flight to protect the wearer from a birdstrike into the cockpit. There are cases on record where the airplane was little damaged but the pilot was virtually blinded by debris flying into his unprotected eyes, or by the shattering of his glasses.



## Personal Notes on

# the Physiology of Flight

By Hy Pochsie

*The air up here isn't bad, I thought to myself. Not bad at all. I had taken my light twin up to 12,500 feet in order to fly over a late summer rainstorm. I knew the oxygen containers were empty, but I figured I'd see what it was like without them—anything to get out of those heavy rainclouds and turbulence. At 12,500 the air was as clear as a bell, but still a little bumpy, so I eased on up another thousand, and then another . . . At 17,500 the air was as smooth as a duck's behind so I leveled off. I could see all that dark heavy stuff moving underneath, and I thought about how clever I was to get away from it.*

*I was breathing a little faster than usual, but that seemed natural considering the excitement I felt at getting over the storm. I wondered how long it would take me to overfly it so I called the flight service station and asked for an update on my en route weather. They were reporting nearly solid IFR all the way to my destination airport. I pondered the situation.*

*"DO YOU READ US, BARON SEVEN-SEVEN ALPHA?" the FSS queried. I depressed the mike button, slowly and deliberately. "JUST THINKING", I said. "I THINK I'LL JUST STAY UP HERE FOR A WHILE."*

*At this point I noticed my fingernails were turning blue. I thought at first I had been gripping the wheel too hard, but actually I was quite relaxed, except that my skin was tingling in various parts of my body. I was tempted to close my eyes and lean back, but somehow that did not seem appropriate. My thoughts were interrupted by another radio transmission: ". . . BARON SEVEN-SEVEN ALPHA, WOULD YOU SAY YOUR ALTITUDE PLEASE?". For some inexplicable reason I felt inclined to reply in rhyme: "BARON SEVEN-SEVEN IS CLOSE TO HEAVEN AT ONE SEVEN FIVE". I figured that would give them something to chew on for a while so they wouldn't disturb my serenity, but they came right back.*

*". . . BARON SEVEN-SEVEN ALPHA WE ARE HAVING TROUBLE READING YOU. CAN YOU SWITCH TO ONE TWO TWO ONE FOR REPLY AND SAY YOUR ALTITUDE AGAIN PLEASE".*

*Well they were determined, if not very bright. I studied the instrument panel for a while and then I decided it wasn't worth it trying to find that channel. If they couldn't hear me on one, why should they expect to do any better on another? Wasn't really any of their business, was it, anyway?*

*". . . BARON SEVEN-SEVEN —" I turned down the volume while I considered a reply which ordinary mortals might understand. Then I picked up the mike carefully with both hands and keyed it: "BARON SEVEN-SEVEN, EIGHTEEN THOU . . ."*

*"UH, BARON SEVEN-SEVEN ALPHA, UNDERSTAND THAT YOU ARE AT EIGHTEEN THOUSAND FEET IN A NON-PRESSURIZED AIRCRAFT. ARE YOU ON OXYGEN?"*

*Another idiotic question. Everyone's on oxygen or he's dead, didn't they know that? On the other hand . . . I turned down the volume again while I pondered the question. I felt absolutely wonderful, really on top of the world, except that if I had to think I got a dull headache in the back of my head and a little dizziness. If they would just leave me alone . . . Finally I blurted out one word, that seemed to stick in my mouth as though I could hardly push it out:*

*"NEG—A—TIVE."*

*"BARON SEVEN-SEVEN ALPHA, UNLESS YOU HAVE AVAILABLE OXYGEN, SUGGEST YOU INITIATE DESCENT IMMEDIATELY."*

*The FSS man went on and on about how my voice sounded strange on the radio and there were other symptoms of "oxygen depletion" that had them worried, so they recommended I drop down to about 5,000 feet quick as I could conveniently do it. Seems like they had got the Center to clear some airspace for me and were all set to vector me down through the clouds to an airport that was reporting 6,000 broken. If I didn't feel like switching to the Center frequency, the FSS would relay instructions for me. Beginning right now.*

*They kept jabbering at me on the radio, but I turned the volume down where it didn't bother me too much and settled back in my seat. I figured I'd run out of clouds*

Left—with oxygen restored, hypoxia symptoms usually disappear quickly, but the memory lingers—providing a valuable lesson for the future. *Right*—after two minutes at 25,000 feet without oxygen, a student struggles to work simple problems that would be easy at sea level.

*sooner or later if I just kept flying where I was. And I was feeling fine, just fine, as long as I didn't have to think anything.*

*Then a loud voice snapped at me over the receiver: "BARON SEVEN-SEVEN ALPHA, DESCEND NOW! EASE BACK ON THE THROTTLES! DO IT NOW!*

*That call shook me up so much I dropped the microphone I had been cradling on my lap. When I started groping for it on the floor I must have pushed the wheel forward because the next thing I knew we were in a steep dive with the wind screaming like crazy and some nut on the radio saying he believed I was descending at an excessive speed and would I please pull back on the power. I kept feeling around for the mike so I could tell them to lay off and I'd be all right, but leaning down made me feel a little sick and dizzy, so I put my head back against the seat and closed my eyes. If anything bad happened, it would be their fault, not mine, that much I knew. There came a blinding flash and suddenly I felt myself being smashed into a million pieces. . . .*

When I opened my eyes I was in pitch darkness. I turned on the overhead light and saw that my night lamp was smashed to bits on the floor near my bed. I was in my pajamas, soaked in sweat, but there was no blood. What a relief—only a dream, but brother what a dream!

Ironically all this happened shortly after I had completed a physiological training course for civilian pilots at Langley Air Force Base near Norfolk, Va., a course designed specifically to prevent such nightmarish flights from taking place. If the course didn't do enough to forewarn me about the consequences of oxygen depletion, that dream was the clincher.

I had checked in at Langley at 7:30 a.m. and spent the morning attending lectures and demonstrations on body and mental response to certain conditions of flight, and the resulting illnesses. These included hyperventilation, decompression sickness, spatial disorientation and self-imposed stresses—as well as hypoxia, of course.

**Hyperventilation**, I learned, is a condition (frequently a consequence of anxiety) in which a person gulps in air so fast that he develops a deficiency of carbon dioxide in his lungs and bloodstream, leading to a decreased oxygen supply to the brain. This can bring about dizziness and nausea, and possibly pilot incapacitation if the condition is not recognized and corrected, which we were shown how to do when using an oxygen mask.

**Decompression sickness**, which could occur following *abrupt* decompression of a pressurized aircraft, is similar to the "bends" sometimes experienced by deep sea divers who ascend to the surface too rapidly. Depressurization releases gases from solution in body fluids so rapidly that bubbles of air are trapped in the body and cause pain, more or less severe, especially at the joints.

**Spatial disorientation** is any condition in which the individual cannot correctly correlate his body position with that of his environment—*up* may appear *down*, a turning in movement may be interpreted erroneously, etc. Circumstances in which the human orientation center, in the ear canals, may not function correctly, were explained, diagrammed, and experienced.

**Self imposed stresses** include anything the pilot does unwittingly which may hinder his ability to function in the cockpit, such as flying when fatigued; taking drugs or medication, suffering from jet-lag, dietary deficiencies, physical ill-being and emotional stress. The degree to which these conditions can impair flying skill was clearly analyzed. For example, we were shown evidence that smoking three cigarettes prior to or during a flight (tobacco is considered a drug) adds an equivalent of 8,000 feet of altitude to the actual cockpit altitude, as regards oxygen intake.

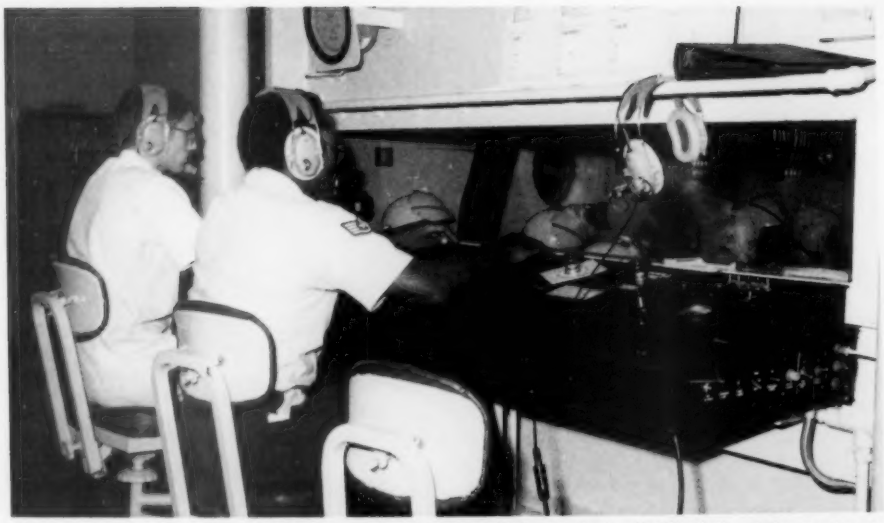
**Hypoxia**, or oxygen depletion, was the subject that received the most attention in our course, perhaps because so much is known about it and so little is understood. We were all able to grasp the principle that as air pressure diminishes, with altitude, our oxygen intake with each breath also diminishes, unless we are in a pressurized aircraft or using supplemental oxygen. *What was difficult to believe was that we could be suffering from hypoxia and not know it.* The insidious nature of this ailment is what makes it a killer: when a pilot becomes even mildly hypoxic his judgement may already be impaired to the point where he is unable to associate various symptoms with their cause, let alone cure.

Moreover, individual response to hypoxia is so varied that no one can predict the extent of oxygen depletion needed to bring on the onset of symptoms—or which symptoms will predominate with any given individual. One person may suffer from headaches, another from dizziness, and another from euphoria under exactly the same conditions.

The course at Langley was designed to give attendees not merely theory but more importantly a physical memory of our individual experience with various inflight incapacitating afflictions. For example, we were whirled around in a Barony Chair and shown how without a visual reference we could lose track of movement in any direction. We were also allowed to experience a sudden change in cabin pressure from 8,000 to 25,000 feet, and to note what kind of decompression symptoms we were subject to.

But the most significant experience (encouraged for all but not mandatory for completion of the course) was a "flight" in the decompression or altitude chamber. This was a white, rectangular metal and glass "fishbowl", about the size of a living room. There were a dozen seats along the inner walls, and more seats on the outside, including one for the medical officer who would control the "flight" and who would be in telephone contact with all participants.

Six of us stepped cautiously into the chamber, a bit nervous and hesitant despite



*Above*—at the chamber control panel technician, *left*, controls "altitude" while instructor monitors class through the window and communicates with those inside via two-way radio. *Below*—instructor checks fit of oxygen mask before student enters altitude chamber.

all the reassurance and jocular ribbing we had been given in preparation. We varied in age from 21 to 59 and included a lawyer, a plumber, a commercial pilot, a student, a clerk and a journalist. We were each assigned a numbered seat and told we would be addressed by number, not by name. To my right an oxygen mask dangled at the end of a hose, and to my left was a console containing switches and lights indictive of the oxygen flow.

We were instructed in the use of the oxygen mask and the headphones. We could communicate with the flight controller on the outside, or the medic-instructor in the chamber with us, only by speaking through the microphone in the mask. The mask itself, a heavy green rubber triangle which pushed heavily against my face, its straps cutting into my skin, seemed a very foreign object that made me uneasy. My eyes focused on the small glass square on the console which would turn white when I drew a breath of oxygen from the system.

I was told, along with my five companions, to try using the oxygen mask, just breathing normally. Instead I found myself sucking away for dear life, like a starving baby on a bottle; my whole body was focused on breathing. Apparently this is a common experience for first-time users of the oxygen mask, and if continued would lead to hyperventilation and possibly nausea or dizziness. I learned how to pause for a few seconds between gulps of air, and to slow down my intake.

As we were getting used to the oxygen, the instructor briefed us on the "flight." We would be taken up to 10,000 feet and then pause, to check for leaks and ear or sinus problems. After that, we would "climb" on up to a simulated altitude of 25,000 feet MSL. Other flights sometimes went to 35,000 feet. At maximum altitude we would be allowed to take off our masks, three persons, at a time, for as much as five minutes, until we experienced the onset of hypoxic symptoms. No one would be allowed to pass out, or suffer pain. Medical personnel would keep us under constant surveillance.

Despite all these assurances I felt a cold sweat on my back when the inside instructor gave the thumbs up sign to the flight controller, and the door to our pressure chamber clanked shut. As the air-evacuating pumps took up their labor and air could be heard swooshing out of the room, I inhaled oxygen and tried to keep my mind free of weird fantasies, especially one that suggested we had all ben shanghaied for some far-out military experiment with dim survival prospects.

After about ten minutes we were informed over the headset that we were now "level at 10,000 feet," and that any one suspecting oxygen leakage or any physical problems should report in. I immediately asked to have my system checked, but my excitement was such that I forgot to key the mike, and consequently I was ignored. This got me even more excited, and I was about to rip my mask off when the instructor finally came over and reminded me how to communicate. There was no leak. No one had any head pains. On and up.

The pumps were now diminishing our air pressure at a rate equivalent to a 3,000 f/m climb. The instructor had stretched a rubber glove over a tin can when we "took off" in order to demonstrate how gases in the body expand at altitude and sometimes cause discomfort (". . . I hope none of you have any remains of breakfast fermenting in your stomach."). At 18,000 feet, considered a halfway point in the earth's atmosphere, the formerly limp glove was fairly well filled out with air, and waved gently at us from time to time.

At 25,000 feet we "leveled off," and half of our group of six were told we could remove our masks, while the other participants observed, and then we would reverse roles. I cautiously loosened my mask without removing it entirely, being concerned about how air at that altitude would feel, or taste. The instructor came over and assisted me in freeing the mask, and I was surprised to find that the air did not feel "thin" or depleted in any way; it seemed no different from air at sea level, despite the fact that I was getting only half as much oxygen with each breath as when we started. I thought to myself, *Why all the fuss? I feel fine!*

I looked around. The other two subjects who were off oxygen also seemed fine and were busy with the worksheets we had been given to fill out. These contained several series of fairly simple problems, some mathematical, some requiring a written answer, some involving photo recognition of panel instrument indications. I breezed through the math, but got a little bogged down writing answers to the second series, so I took up the photos instead. Apparently I spent a long time staring at the first one, because the instructor came over and asked me how I felt.

Mask removed, at a simulated 25,000 feet, pilot anxiously awaits onset of hypoxia symptoms as a fellow student watches with interest.

*Photo by Lee Michael Katz*

"Great," I said.

Actually I had begun to feel an odd sensation in my skin, as if I were subjected to hundreds of tiny pinpricks. It wasn't really painful, but a little distracting. I also experienced occasional unpleasant hot and cold sensations in my face, and some dizziness when I tried to focus my attention on the photograph. *Was the altimeter showing 1,500 feet or 15,500?* Seemed like a stupid way to design the instrument.

I went back to the written questions, but had no better success. My writing was reduced to illegible henscratching, and I could not focus my eyes. I was tapped on the shoulder and told to go back on oxygen. I had been off of it for less than three minutes.

When I put down the worksheet I suddenly lost all sense of unpleasant feelings and just felt wonderful—*euphoria*, I believe the doctors call it. I didn't want to put the mask on. Finally the instructor did it for me. Over the intercom I asked the flight controller:

"Can I take it off again?"

"No. You got some pretty good symptoms pretty quick there, didn't you? Surprising for a young fellow like you. How much sleep you get last night?"

I admitted to three—almost four—hours.

"That makes you a lot more sensitive. Remember that the next time you have to go flying. No carousing the night before. Okay?"

"Okay."

We had been informed that the average "time of Useful Consciousness" (before you virtually pass out) at 25,000 feet ranges from three to five minutes, depending upon age and physical condition. As a young, healthy male, my performance was clearly on the down side, and would have been weaker still—perhaps by as much as a minute—if I had been a smoker. Fatigue and nicotine can evidently offset the advantages of youth, in tolerating oxygen depletion. I wondered how long I would have lasted at 35,000 feet.

During descent we were all urged to practice the "Valsalva" procedures for clearing the head—which we had been taught earlier—whether or not we had ear pains. Pain is sometimes experienced when the air pressure in the middle ear is not equalized with the ambient air, thus exerting positive (during ascent) or negative pressure (during descent) upon the ear drum. Equalization failure is due to clogging of the Eustachian tube, which connects the middle ear to the nasal cavity. The Valsalva procedure consists of pinching the nostrils shut with the fingers, closing the mouth and exerting upward pressure with the abdominal muscles to force air into the Eustachian tube.

The problem can also be solved sometimes by yawning, swallowing, or chewing gum. Caution: the Valsalva should not be performed when you have sinus trouble or a headcold—but then you should not be flying at such times either. As predicted, we found the procedure more difficult to perform on the way down than on the ascent. When one of the subjects experienced difficulties during the descent, the instructor used a nasal spray to assist in opening the air passages in his head.

At 18,000 feet we paused again to take off our masks and expose ourselves to mild hypoxia. After the experience at 25,000 feet we all felt pretty confident that we were in full control of our faculties. However, when we were handed a color wheel, we found it a little difficult to distinguish color separations clearly; they all seemed dull and fuzzy, as though deteriorated by age. Later, after going back on oxygen, we looked at the same wheel and the colors were so bright they seemed to jump right off the paper.

After a successful "landing" at sea level, four of us remained in the chamber to experience an abrupt or rapid decompression. The air evacuating pumps took us up to a simulated altitude of 8,000 feet and then the air pressure was reduced to the equivalent of 29,000 feet in less than 20 seconds. Although we were not using the oxygen masks, we had no difficulty breathing normally at first, but we were not quite prepared for the sudden condensation of fog in the chamber—which is actually what happens when the window or door of a pressurized aircraft blows out at altitude. Clouds of dust and a scattering of light debris may also be present during an actual rapid decompression, were were told, which can be upsetting to airmen who have never experienced this phenomenon before. If the decompression of an aircraft is *very* rapid, persons seated near the blow out opening could be sucked out of the aircraft, if not restrained—which is a very good argument for keeping one's seatbelt fastened at all times.

At this altitude the Time of Useful Consciousness is only one to two minutes. We kept our masks handy, but were encouraged to permit some symptoms of hypoxia to occur before we put them on, to help reinforce our physical memory of the symptoms most likely to attack each of us.

As the youngest of the four participants, I tried to stick it out for the maximum three minutes we were allowed to be off oxygen. I felt pretty well except for that by-now-familiar tingling of the skin at the back of my neck, but when I noticed a grayish cast in the color of my finger tips and had difficulty counting them I grabbed the mask and put it on: time elapsed, 2½ minutes.

The flight controller came on the intercomm. "Are you all right, Number three?"

"Right as rain, chief. Take her down."

My voice sounded unusually jocular, which suggests that euphoria had also set in. But all symptoms dissipated quickly as soon as I started breathing 100% oxygen. This time after we "landed" the masks were stowed away and we were congratulated by the flight controller and the instructor on our successful performances. We all shook hands rather solemnly, and filed out of the chamber chest high, as though a roomful of international press photographers were waiting to greet us.

Later we were able to relax and talk about how we felt and what we had observed of one another. Many things seemed funny then, and there was a lot of kidding, but underneath it all I believe we felt a certain bond, as though we had shared a learning experience that might save someone's life. We had all heard many lectures about the importance of understanding one's own physiology, in relation to certain conditions of flight that might prove hazardous, and the need to be able to recognize one's own symptoms. But nothing said to me had nearly as strong an impression as actually experiencing the symptom. It's a case of "feeling is believing."

For $5.00, it was a bargain course.

*(Editor's note: A commentary on Mr. Pochsie's experience will appear in the next issue of this magazine, together with additional data on the subject of physiological preparation for flight, and a listing of facilities where this type of course may be taken.)*

# A New Era for Air Taxis?

## *Proposed Revision for Part 135, Air Taxi and Commercial Operators*

Everyone interested in aviation is invited to comment on a Notice of Proposed Rule-Making concerning Part 135 of the Federal Air Regulations, which governs air taxis, commuter air carriers, and commercial operators.

The notice proposes substantially revised FAA requirements for operations by persons who now hold or in the future will seek air taxi/commercial operator certificates. The proposals would provide greater operational flexibility for the air taxi/commercial operator and a higher level of safety. The air taxi/commercial operator industry has grown substantially in recent years and this growth has been accompanied by use of larger and more complex aircraft. In addition, segments of that industry have advocated that they be permitted to operate larger aircraft under regulations developed to apply to those operations.

*Air taxis* are a classification of air carriers providing public transportation and certificated by FAA under Part 135 of the Federal Aviation Regulations. These rules are less stringent than those which govern the major air carriers operating under Part 121 of the FARs.

A commuter air carrier, as identified by the Civil Aeronautics Board, means an air taxi operator who (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week and places between which such flights are performed, or (2) transports mail by air, pursuant to contract with the United States Postal Service.

A *commercial operator* means a person who, for compensation or hire, engages in the carriage by aircraft in air commerce of persons or property, other than as an air carrier or foreign air carrier or under the authority of Part 375 of this Title. Where it is doubtful that an operation is for "compensation or hire" the test applied is whether the carriage by air is merely incidental to the person's other business or is, in itself, a major enterprise for profit. (FAR Part 1)

The current Part 135 *does not* apply to:

(1) Student instruction.

(2) Nonstop sightseeing flights that begin and end at the same airport, and are conducted within a 25-mile radius of that airport.

(3) Ferry or training flights.

(4) Aerial work operations, including (i) Crop dusting, seeding, spraying, and bird chasing; (ii) Banner towing; (iii) Aerial photography or survey; (iv) Fire fighting; (v) Rescue operations; (vi) Helicopter operations in construction or repair work (but not including transportation to and from site of operation); and (vii) Powerline or pipeline patrol.

(5) Rotocraft external load operators

(6) Emergency mail service.

(7) Any other operations specified by the Administrator.

Typically, air taxis (both fixed wing and rotorcraft) fly to local or out-of-the-way places and provide an "on demand" service available day or night, or on limited schedules. Aircraft used may be a single engine airplane or a sophisticated twin loaded with electronic gear.

The subparts of Proposed FAR Part 135 include:

*A—General, B—Flight Operations, C—Aircraft and Equipment, D—VFR/IFR Operating Limitations and Weather Requirements, E—Flight Crewmember Requirements, F—Flight Crewmember Flight and Duty Time Limitations and Rest Requirements, G—Crewmember Testing Requirements, H—Training, I—Airplane Performance, K—Maintenance, Preventive Maintenance, and Alterations.*

Publication of the proposed new rules is the latest step in an FAA review of air taxi regulations initiated in 1972, when it became apparent that the industry was on the threshold of rapid expansion and modernization. There are currently over 4,000 air taxi operators in the United States.

On September 13, 1976, FAA officially announced a Part 135 Regulatory Review Program. There were 112 proposals for rule changes developed. In November of that year a national conference was held in Denver to discuss the 112 proposals then under review. Following the conference, numerous written comments were received and reviewed, and on August 29, 1977, a notice containing 131 proposed new rules or amendments to Part 135 was published in the Federal Register. Copies of the proposal have been mailed to all Part 135 Certificate holders (commercial, air taxi, etc.). For additional copies, write FAA, Office of Public Affairs, Attention: Public Information Center, APA-430, 800 Independence Ave., SW, Washington, D.C. 20591.

All interested persons are invited to comment on these proposals by sending a written statement in duplicate, before November 28, 1977, to:

Federal Aviation Administration
Rules Docket, AGC-24
Docket No. 16097
800 Independence Ave.
Washington, D. C. 20591

For further information about the proposals or the Part 135 Regulatory Review Program, contact:

Donald A. Schroeder
FAA, AFS-901
Washington, D. C.
(202) 755-8715

# The First U.S. Airman was a Flying Physician

Dr. John Jeffries in his leopard-skin cap

It was not an Englishman, as might be supposed, who first successfully flew over the English Channel, but a French balloonist, Jean Pierre Blanchard, engaged by a Yankee physician, Dr. John Jeffries, in 1785. This feat along with their earlier ascent over London, marked the first scientific study of the atmosphere, the first sustained flight by an American, and the first paying air passenger (Jeffries).

There was one other minor "first": the cork vests worn by the pair for overwater survival equipment are not far removed from some of the life jackets in use today.

In its time, the cross-channel flight was a fantastic achievement, ranking in popularity and acclaim with Charles Lindbergh's flight across the Atlantic 144 years later. Ballooning, or "levitation" as it was called, was in its infancy, considered a daredevil amusement at best and a terrible nuisance at worst. Although rich and poor gathered in great throngs to gawk at the huge inflated bags and their odd-shaped "cars" or gondolas, soaring over the treetops and buildings, ballooning also held the interest of contemporary scientists as a means of exploring the earth and its environment. The aeronaut, or balloon pilot, was the science-fiction hero of the time.

Dr. John Jeffries was a 40-year-old Boston physician who, in the year 1784, decided he had amassed sufficient means to indulge his curiosity about flying as a human experience. Successful human flight had been accomplished for the first time in Paris in 1783, in a balloon, so Dr. Jeffries engaged a noted French balloonist, Jean Pierre Blanchard, to make an experimental flight with him over London.

The objectives of this flight, which took place on November 30, 1784, were to experiment with various means of controlling ascent and descent; to test the usefulness on oars or movable wings for maintaining a true course; and to make observations of the quality, temperature and current flow of air at various levels. Jeffries carried a thermometer, barometer, hydrometer, electrometer and six glass-stoppered vials filled with distilled water. ". . . *Besides which, I took with me a very good telescope, and several yards of very thin light ribbon, colored, which I could occasionally cut into small bits (for wind indication) . . . and had ready in my pocket a sharp strong knife and scissors . . .*"

Their balloon was 27 feet in diameter, with a boat-shaped gondola suspended under it like those devised earlier by the noted physicist John Alexander Charles. There were also the oar-like wings, favored by Blanchard, who had discarded the hoop around the middle and the parasol above the car that he had used in his flights in France. The oars were covered with bright silk, and a dolphin-like wooden rudder protruded from the rear.

For the one hour and 21 minute flight over London, the barometer varied from 30 to 21.25 inches of mercury, representing an altitude gain of about 9,250 feet; the electrometer showed no change, and temperature varied from 51 to 28.5 degrees F. One by one the water was emptied from the bottles and air samples collected. These were later analyzed by Henry Cavendish, British discoverer of hydrogen, with results that have been confirmed by modern analysts.

In flight, Jeffries was utterly elated as the balloon soared over cheering crowds, treetops buildings and houses. Blanchard applied himself to manning the oars, trying to steer the aircraft, and Jeffries methodically made notes on his observations ". . . *At 51 minutes after two, I threw out a handkerchief, as a signal to my friend, Mr. Thayer, which I was able to keep sight of for more than two minutes . . . At 55 minutes after two, I emptied vial No. 6, and carefully corked it up . . .*".

Blanchard, when he was not "rowing," threw pamphlets overboard to the trailing

crowds. Jeffries wrote four cards addressed to friends, attached them to handkerchiefs and sent them into the breeze. He later learned that three of his airmail notes were correctly delivered.

There was much fog and wind but eventually the balloon rose above the weather. *". . . M. Blanchard now began first to complain of the cold and drew on a thick cap. A little dog, which I had taken with me, crumpled himself up at my feet and began to shake and shed tears with the cold, which I too found to be severe, and caused a pain and singing in my ears; on which I followed M. Blanchard's example, and put on a fur cap . . . We then threw over more of the pamphlets and sundry other little articles . . ."*

Jeffries continued his observations in great detail, including throwing bits of ribbon out to check the wind directions. Finally *". . . we now refreshed ourselves with cold chicken, and drank a few glasses of wine to the health of our friends below; after which I emptied vial No. 3 and secured it . . ."*

The eventual landing was rough, but no one was hurt. Jeffries noted in his journal: *"Although our voyage was not distinguished by the length of time we were in performing it, or the distance we went, yet I cannot but hope that the foregoing observations may be of some importance; and in relating them I have adhered to simple facts as they occurred, or as they appeared to me."*

John Jeffries was a happy man after this first ballooning experience. He turned over his vials of air to the secretary of the Royal Society, documented everything he could think of that might be of use to future aeronauts and almost immediately began planning his next adventure—ballooning across the English Channel.

This second voyage took place on January 7, 1785, and it was not without incident. Jeffries had agreed to pay Blanchard for all the materials and labor to fill the balloon and transport it to Dover—a sum of 700 pounds sterling—but Blanchard at the last minute decided he did not want to share the glory of this first channel crossing with the American doctor. Since there was already grave concern about the weight of two men versus one, particularly on an untried overwater flight, Blanchard secretly had his tailor sew some lead weights into his coat. At the same time he circulated rumors that Jeffries had backed out. Jeffries discovered the trickery when the tailor mistakenly delivered Blanchard's suit to him rather than to the scheming Frenchman. After much serious argument, persuasion, and an extraordinary signed agreement stating that *"If there was a case of necessity on our passage I would get out of the car for his (Blanchard's) preservation . . ."* Jeffries was able to "pursue this experiment" of ballooning across the English Channel.

The balloon was filled just before one o'clock in the afternoon of the flight. It was then hauled to the edge of a cliff, where Blanchard and Jeffries attached the wings, or oars. They carried with them three sacks of sand ballast (10 pounds each) a large parcel of pamphlets, two cork jackets, a few extra clothes (formal wear for Paris for Blanchard), a number of inflated bladders, two small anchors or grapnels with cords attached for their landing, and Dr. Jeffries' barometer and mariner's compass.

Some early aeronauts were convinced that oars could be used for steering and propulsion.

As they rose from the cliff, Jeffries noted that the barometer was at 29.70 and the wind appeared to be about north-northwest, *". . . though so much of a calm as to make the sea appear like a fine sheet of glass . . ."*

The beginning of the flight was fairly uneventful with the voyagers enjoying the scenery and mild weather, soaring over several ships that saluted them with their colors. By 1:30 p.m. the balloon was fully distended, so they drew the car up close to it. *". . . Recollecting the importance of a sufficiency of inflammable air (hydrogen) to the completion of our Voyage, and that it was not possible to determine exactly how much of it might escape if we opened the valve, we only untwisted the two tubes at the bottom of the Balloon, by which it had been filled with the gas (hydrogen) and cast them over the sides of the Car; and in a minute or two we had the pleasure to see them become distended through their whole length . . . We also had the farther satisfaction to observe, that by this method, no more of the gas or inflammable air would escape than was absolutely necessary to relieve the balloon, and to prevent it from bursting . . ."*

About a third of the way across, Jeffries discovered the mercury in the barometer rising fast and decided to throw out two sacks of ballast. This helped for a while, but about half-way across the channel they were again descending, so they dumped the remaining sack and a half of ballast and the parcel of pamphlets. By 2:15 they had thrown out all the remaining pamphlets and small parcels. *". . . We had not now anything left to cast away as ballast in future, excepting the wings, apparatus, and ornaments of the car, with our clothes and a few little articles . . ."* Fifteen minutes later they were again going down very fast; the balloon seemed to be only about three-fourths full. At this point they threw out everything they could find, including apples and biscuits, one of the oars, then the other, and finally they cut away the lining of the car and all the outside decorations.

*". . . As we did not yet ascend, we were obliged, though very unwillingly, to throw away our anchors and cords; but still approaching the sea, we began to strip ourselves, and cast away our clothing, M. Blanchard first throwing away his extra coat, with his cape, after which I cast away my only coat; and then M. Blanchard his other coat and trousers. We then put on and adjusted our cork jackets and prepared for the event . . ."* Shortly after, they tossed out their last bottle of wine.

*". . . We appeared at this time to be about three quarters of the distance towards the French shore, and we were now fallen so low, as to be beneath the plane of the French cliffs. We were then preparing to get up into our slings, when I found the mercury in the Barometer again falling, and looking around, soon observed that we were rising, and that the pleasing view of France was enlarging and opening to us every moment, as we ascended, so as to overlook the high grounds . . ."*

They passed over Calais and a number of villages and towns. The mercury in the barometer had now fallen to 23.30 inches, so Blanchard decided to deliver his "airmail" packet of letters. Although the weather was mild and clear, Jeffries noted that without their clothes, they were almost "benumbed" with cold.

Again, they began to descend, so they threw out their only remaining ballast—the cork jackets. By this time they were skimming the treetops . . . *"They were very large and rough . . . and we were descending with great velocity toward them. The fear then was that the car might be forced into some of the trees so violently as to separate it from the cords that connected it with the net which covered the balloon."* Some kind of ballast had to be found that would alter their course—but what?

*". . . Happily it occurred to me that probably we might be able to supply it from within ourselves, recollecting that we had drank much at breakfast. From the severe cold, little or no perspiration had taken place, and . . . probably an extra quantity (of fluid) had been secreted by the kidneys, which we might now avail ourselves of by*

*discharging into two of our air bladders. . . . We were enabled to obtain, I verily believe, between five and six pounds of urine; which circumstance, however trivial or ludicrous it may seem, I have reason to believe, was of real utility to us, in our then situation . . .*"

Now, instead of being forced into the trees, they passed over the taller ones and Jeffries was able to grasp a large branch. At this point the balloon perversely became intent on ascending, until Blanchard was able to valve enough gas out of it so that the car would settle into the branches.

". . . *We instantly set about emptying the balloon and used every other exertion to acquire some warmth, and recover the use of our limbs, which were much cramped and stiffened from the cold, and the situation we had been confined to in our car . . .*"

A group of horsemen had watched the progress of the balloon. Having been informed by a royal proclamation that balloons were a harmless invention of man and not the devil, and warned not to attack the bag with pitchfork or gun as had been done on at least one occasion, these gentlemen rode up and gave the naked aeronauts a warm reception—and warm clothes. They then took Jeffries and Blanchard to Calais, where a huge celebration was in progress.

Blanchard was given the freedom of the city in a gold box and the city bought the balloon to preserve in the church, as a memorial to the event. Later they erected a marble monument on the landing site. Several days later, the two aeronauts were summoned by the king to Paris, where he awarded Blanchard a gift of 500 pounds Sterling and an annual pension of 1,200 livres (about $140 at the present rate). The queen gave him her gambling winnings. Dr. Jeffries was given royal approval.

The Paris welcome lasted a full two months, with theaters, parties and balls morning, noon, and night. Jeffries had several meetings with another noted experimenter, Benjamin Franklin, and with John Paul Jones.

Jeffries returned to Boston where he founded a large family (11 children) and a thriving medical practice in which he was eventually succeeded by his son, his grandson, etc., on down to present-day descendents, The accounts of his two ballooning exploits were read before the Royal Society, and printed and published in London in 1786. The good doctor made no further balloon flights after the epic trip across the channel, although he did help Blanchard achieve the first flight in America, performed solo in the presence of President George Washington and a large crowd at Philadelphia, on January 9, 1793.

Jeffries, who died in 1819, is still remembered each year when the Institute of Aeronautical Sciences presents the Dr. John Jeffries Award, established in 1940, to the physician making the most valuable contribution to aviation medicine. □

## BRIEFS

TYPE RATINGS. A revised FAA list of pilot certificate designations for the various aircraft type ratings incorporates new designations for all aircraft that were type certificated as of May 1, 1977. Many aircraft types previously spelled out are now being coded in a shorter version. (Boeing 727 becomes B-727 on pilot certificates.) However, pilot certificates bearing the older designations will not have to be converted to the new designation. Copies of the new list are free. Request "Pilot Type Rating Certificate Information" (AC 61-86) from the address below.

ANOTHER ANGLE TO THE FUEL STORY. A new switch on the proper-octane-fuel problem is beginning to appear with the advent of some new models of small, trainer-type airplanes equipped with engines designed for grade 100 gasoline. Because predecessor models (which are often quite similar in appearance to the newer designs) use grade 80 fuel, pilots and line service personnel at airports that sell both grades of fuel are cautioned to check the placard near the fuel tank opening for the proper grade required, before fueling. Pilots who are not present during the refueling process should check the fuel color before starting engines. Some of the 1977 models that require 100 octane are the Cessna 152, Cessna Skyhawk/100, Piper Cherokee Warrior II, and the Grumman Lynx. Using a lower grade fuel than designated will harm an airplane engine.

BELLY LANDINGS. Every year a surprising number of gear-up landings go into the accident records. For example, of all the "retractables" involved in accidents in 1975, 18 percent experienced landing gear accidents, 44 percent of which were the result of human factors. A revised FAA Advisory Circular details the reasons behind these accidents ("neglected to extend gear" leads the list) and suggests procedures for reducing the possibility of being involved in an unintentional belly landing. "Prevention of Retracable Landing Gear Failures" (AC 20-34B) is free.

JUMP START. Pilots and line service personnel are advised that after auxiliary power cables have been used to start an airplane engine, care should be taken to assure the cables are pulled straight out of the receptacle. In a number of recent cases, cracks in the structure near the auxiliary power unit receptacle are believed to have been caused by side and/or down pressure as cables were carelessly removed.

AC NOTAM HANDBOOK. An FAA handbook on the Notice to Airman (NOTAM) system is now available to the public as an advisory circular. The 86-page book describes the different types of NOTAM, explains how they are originated, disseminated and cancelled, and lists the kinds of information a pilot may expect to receive by NOTAM. The publication should be of particular interest to those who may have some responsibility for originating NOTAMS, such as airport owners or operators. "National Notice to Airmen (NOTAM) System", (AC 210-4) is free from DOT/FAA Distribution Unit, TAD 433.1, Washington, D.C. 20590.

## Smaller N-Numbers Approved

Smaller N-numbers are permitted on most small aircraft under an FAA rule change that became effective September 14, 1977. The amended regulation (FAR 45.25 through 45.29) allows numbers as small as three inches (rather than the present 12-inch markings) on aircraft with speeds less than 180 knots. The markings may be placed either on the sides of the fuselage or on the sides of the vertical tail. Tail markings may be either horizontal or vertical and no underwing marking is required. The new rule was initially requested by the Experimental Aircraft Association.

There is no change in the requirement for marking on other aircraft; they still must have 12-inch horizontal markings on either tail or fuselage, if previously required.

In announcing the rule change, FAA said the use of smaller numbers is consistent with the current position of the Department of Defense, that 12-inch numbers are not required for air-to-air identification of slower aircraft that penetrate restricted airspace.

## Public Opinion Solicited on Air Ambulance Rules

The public is being asked to comment on regulatory standards for "air ambulances", which have been proposed by FAA to insure that the medical needs of patients are met without compromising flight safety. The standards for on-board medical facilities would apply to all air taxis and commercial operators of small aircraft when carrying persons who are ill, injured or otherwise require medical attention. At present, there are no standards governing on-board medical equipment or personnel for such flights.

Under FAA's "Advance Notice of Proposed Rule Making", each air ambulance flight would be required to carry certain basic equipment such as face masks, blankets and pillows as well as specialized equipment to meet the needs of individual patients (litter, resuscitator, medical oxygen, etc.). Medical attendants would be required for intensive care patients. Additional requirements would be imposed on "Rescue Air Ambulance Operators", a new classification covering those who provide medical emergency transportation on a regular basis.

The FAA anticipates comments on the possible economic impact of proposed standards on aircraft operators, consumers, and the medical community, and on the question of FAA jurisdiction over these matters.

Copies of the ANPRM #77-14 may be obtained by writing FAA, APA-420. Comments should be sent in duplicate to FAA, AGC-14, Washington, D.C. 20591 before October 25, 1977, mentioning the notice number.

## Research Conference Focuses on General Aviation

Surface weather reports for even relatively small general aviation airports could be made available through the use of an "aviation automatic weather observation system" (AV-AWOS), one of the current projects described at the FAA General Aviation Research and Development Conference held at Atlantic City, N.J., in August. Such terminal reports could allow approval of instrument approach procedures at many airports where IFR approaches are not now possible.

Also disclosed at the conference was the news that FAA is moving toward eliminating written tests as a pre-requisite for pilot certification and replacing them with an in-depth oral exam. Jim Riddle, Chief of FAA Flight Standards General Aviation Certification and Operations Section, said that the agency is preparing a notice of proposed rule making on the subject, after which the public will have an opportunity to comment. The new method is expected to be used initially for air transport pilot and flight engineer certificates, with others to follow. No dates were announced.

Other research projects presented at the meeting included a program for determining the most effective types of low-cost marking and lighting for use on small sod airstrips; and evaluation of an "approach fish", a modified wind sock consisting of a 20-foot long, fish-shaped "sock" on a 20-foot high swivel pole, designed to give the landing pilot a more accurate picture of wind direction and velocity in both gusty and very light wind conditions.

## New FAA "Aviation Instructor's Handbook" Published

A new FAA publication, "Aviation Instructor's Handbook" has been issued to replace the old "Flight Instructor's Handbook." In its new form the book has been expanded to provide guidance not only for Flight Instructors, but also for aircraft maintenance instructors.

The 126 page book also includes a comprehensive section on instructing in general, effective communication, teaching methods and instructional aids, critiques, etc.

"Aviation Instructor's Handbook" (AC 60-14) is available at Government Bookstores, many retail outlets such as airport fixed base operators and flight schools, or by mail from Superintendent of Documents, GPO, Washington, D.C. 20402. Price is $2.75. (When ordering by mail mention stock # 050-011-00072-1).

## • Last of the Fleet

We enjoy your articles and look forward to them every month. I would like to make one comment regarding the caption under the photo on the news page of the June issue. As reported in your magazine, the beautifully restored 1926 Western Airlines Douglas M-2 in the picture was en route to Washington, D.C., to be displayed in the Air and Space Museum when it threw a rod near here and we loaned it another Liberty V-12 engine to finish the flight.

You stated, however, that this particular airplane is "the last of the original mail planes still flying." Our Air Museum still proudly flies a Stinson S-6000 *Trimotor*, (NC11153) which flew airmail routes in the early 30's for American Airways and for Chicago and Southern Airways. There is also a Pitcairn *Mailwing* operating on the east coast and several *Wacos* throughout the country.

David Allyn
Wings of Yesterday Museum
Santa Fe, N.Mex.

*The airplane pictured is the last of the original fleet of Western Air Express (predecessor of Western Airlines) contract air mail planes.*

## • The Truth About Test Guides

In your May issue it was mentioned that FAA is going to release all the questions and answers of private, commercial, instrument and ATP written tests. Now I hear rumors that they will not be released! Please make it clear for us—are you, or are not you, going to release those questions and answers?

Jim Ilkhan
Jamaica, N.Y.

*Written test guides in the new format, containing questions in approximately the same form as those used in the exams, have been published for the private pilot, commercial pilot, and flight instructor ratings. The correct answers to the questions are not given in the guide.*

*The test guides are available from the Superintendent of Documents, GPO, Washington, D.C., 20402 at the following prices: Private Pilot (AC 61-32B), $2.30; Commercial Pilot (AC 61-71A), $2.30; and Flight Instructor (AC 61-72A), $2.70.*

## • Standard Rate Turn

I think your magazine is an outstanding source of information to the general aviation pilot and I look forward to your consistently informative and interesting articles.

However, in your May 1977 article "Spinning Wheels", which I thoroughly enjoyed, reference is made to a "standard four-minute turn (3° per second)." Wouldn't a standard rate turn of 3° per second be a two-minute turn?

Carl L. Dworman
Wickford, R.I.

*Two-minute turn is correct for standard rate. The sentence should have read "For a standard two-minute turn (3° per second) the needle is held at one needle-width off center—on a two-minute instrument. On a four-minute instrument that position would indicate a half-standard turn." Our thanks to you and to a number of other sharp-eyed readers who called attention to the typographical error.*

## • CARs & CAMs vs. FARs

The article in your June issue on acrobatic aircraft leaves me somewhat confused as what I can do legally with my utility airplane. CAM 3 indicates clearly that loops are verboten, but your article seems to leave the door open. Who or what is right?

Allen Greenspoon
Amarillo, N.M.

*CAM 3 discusses design requirements and limitations which must be reflected in the flight manual and/or placarding of aircraft built when CAR 3 (Civil Air Regulations) was in effect. CAR 3 was eventually recodified into Part 23 of the FARs, and all aircraft certificated subsequent to this recodification should be operated in accordance with Part 23 requirements and limitations. Note that Part 23 does not approve loops for utility aircraft. Note also that any aircraft, regardless of category, may not be flown in maneuvers which are prohibited by the flight manual or placards.*

## ALTERNATE AIRPORTS REVIEWED

The May 1976 GENERAL AVIATION NEWS "Instrument Corner" contained a letter from Mr. Phil Branagan of South Bend, Ind. who asked: If the terminal forecast for a given airport calls for above minimum conditions, but also contains phrases such as "occasionally" or "variable" or "chance of," with regard to below minimum conditions, is it permissible to designate that airport as an alternate when filing an IFR flight plan?

Our reply was in the affirmative. However, the Office of Chief Counsel, FAA, has since reviewed this subject and determined that an airport covered by such a terminal forecast would not qualify as a legal alternate under FAR 91.83(c). The forecast must indicate that the weather conditions *will* be at or above appropriate minimums at the anticipated ETA. Accordingly, any indications in the forecast as to the possibility of below minimum conditions prevailing at the ETA would disqualify the airport.

**FAA GENERAL AVIATION NEWS** welcomes comments from our readers. No anonymous letters will be used, but names will be withheld on request. Address: FAA GENERAL AVIATION NEWS, AFS-807, Washington, D.C. 20591.

## • 100LL Experience

Would you like to hear about some real life experience regarding 100 LL gasoline in 80 octane engines? After about 350 hours of operation my engine needed a top overhaul (valves, rings, pistons, guides, lifters, seats) for a cost of $1,000 plus. I'm talking about 1975 model aircraft compared to previously owned 1964 and 65 same model aircraft, which were OK on 80 octane. And some people think you can operate these engines without any problem if you follow proper leaning and ground operations as stated in various aviation publications!

Arthur R. Johnson
Glendale, N.Y.

*By now you probably know that Grade 80 aviation fuel is becoming more available throughout the country, which should solve your problems if they are all related to fuel. Meantime, if you have not done so, we suggest you discuss your situation with the customer service department of the engine manufacturer. They have done considerable research on the subject and have the latest information on how best to live with fuel of a higher lead content than your engine was designed to burn. We have received several reports from aircraft owners who are achieving excellent results by carefully following manufacturer's recommendations for leaning, shutdown procedures, power settings and frequent cleaning and rotating of spark plugs.*

## • Hot Props Do Happen

Your June article "Switch Off" discussed faulty ignition switches and recommended that pilots check switches regularly for proper grounding. I thought the article was a good one in view of the fact that prop accidents continue to happen, with about the same number occurring annually now as they did back in the days when propping was used all the time for starting.

Recently in this area we had such an incident, although fortunately no one was injured. When the pilot of a Cessna 206 could not get his engine to start a friend offered to prop it. The pilot took the key from the switch and placed it on the top of the panel in clear sight of the other man, who proceeded to position the propeller for the propping operation. At the first small movement of the prop (with switch off) the engine roared to life, sending the "propper" scrambling to safety. Interestingly, when the pilot inserted the key and turned it on, the engine stopped. Obviously something wrong somewhere—and that is exactly the way prop injuries happen.

I do not, however, agree with your suggestion to check the ignition grounding during the pre-flight; I prefer to make that check just prior to shutdown. Then I can leave the airport confident that the switch I just turned to "off" is really off.

Ken Hoskins
Cleveland, Ohio

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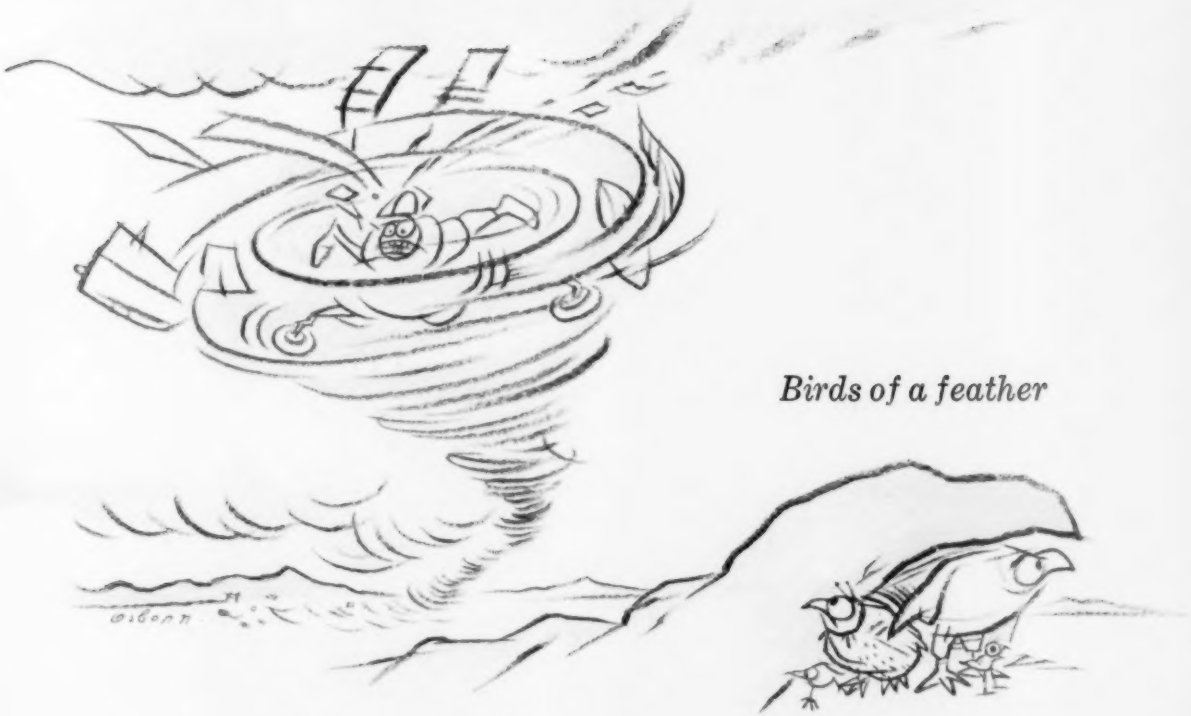

*Birds of a feather*

*Avoid hurricane weather*